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Critical Remarks on the Synonymy of Certain *Anchylopera* Species, with Descriptions of New Species (Lepidoptera, Eucosmidae)

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INTRODUCTION

Since the treatment of the genus *Anchylopera* in Heinrich's revision of the subfamily Eucosminae (1923, Bull. U.S. Natl. Mus. no. 123, pp. 233-242), little has been done to straighten out the involved synonymy of the individual species, although it was stated at the time that "the genus presents considerable difficulty as the few North American species are nearly all mixed in our collections and the names juggled around in a most confusing fashion."

In connection with the identification of Nova Scotian material it became evident that the above was a decided understatement and that until very definite and accurate information could be obtained concerning the types of the various species, if indeed they still existed, it would be impossible to arrive at any satisfactory conclusions. The author's original intention was to present a complete monograph of the genus, but it was soon realized that the time for this was hardly ripe as so many loopholes still existed in our knowledge of the early stages and that only by the study of bred series of specimens from known food plants could an adequate idea of each individual species and its range of variation be obtained. As, however, a certain amount of progress has been made and some apparent errors in Heinrich's treatment of the nomenclature and

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synonymy of the various species have been brought to light, it would seem to be a step in the right direction to correct such mistakes. It is with this intention that the present article is presented.

The results obtained are to a large measure due to the coöperation of those in charge of this section of Lepidoptera in various museums in North America and England. Through the courtesy of Mr. J. W. Bradley of the British Museum (Natural History), London, it has been possible to have specimens matched with the types of the various species described by Walker and Zeller, both as to maculation and as far as possible in regard to male genitalia. In some doubtful cases specimens agreeing with the holotypes, including some "cotypes," have been sent for study, as well as enlarged photographs of the types themselves. It is felt, therefore, that, for the first time, the identity of such species has been placed on a far firmer basis than heretofore; this has resulted in considerable changes in the nomenclature as given in Heinrich's revision. Through the kindness of Mr. J. F. Gates Clarke of the United States National Museum at Washington the genitalic slides that were used by Heinrich in his illustrations of these organs, as well as the specimens from which they were made, have been made available for study; with these a good deal of unidentified material was submitted. Dr. A. B. Klots has forwarded virtually the entire, very considerable collection of *Anchylopera* species in the American Museum of Natural History and in his own collection. Containing as it does a great deal of the Kearfott material and specimens compared by this worker with Clemens' types, as well as material named by Heinrich while preparing his revision, it has proved of the greatest value. Through the kind offices of Drs. Freeman and Munroe it has been made possible to examine again the *Anchylopera* material from the Canadian National Collection, which contains in greater part the species as named by the present author during his term of office in Ottawa. Finally from Dr. A. E. Brower of Augusta, Maine, a collection of specimens taken in Maine has been sent for identification. To all these workers the author's sincerest thanks are due.

In spite of this large aggregation of specimens, a study of them has made it woefully evident that in certain groups, or what might be termed "complexes," it has been impossible to differentiate at the present time between forms and races and what may possibly be distinct species. This is particularly the case with the species *subaequana* Zeller and *burgessiana* Zeller, of which the nymotypical forms have been correctly placed by Heinrich but with which a number of variant forms appear to be associated on the basis of genitalic characters. Concerning the status of these forms it seems hopeless to arrive at a definite conclusion until the

early stages have been worked out, both of the typical forms and also of their variants. The same difficulty applies to Clemens' species *fuscociliana* and *dubiana*, placed by Heinrich, in the author's opinion wrongly, as belonging to a single unit. While specimens exist in both the Canadian National and American Museum collections that have been compared carefully with the so-called holotypes by Freeman and Kearfott, respectively, a number of forms have been found in both these collections that show a certain degree of variation from the compared material in both color and maculation and also slightly in male genitalia. As we have as yet no knowledge of the early stages of any of these forms, it seems advisable to leave matters *in statu quo* until bred series are available (especially in the present case) from Virginia which is the type locality for these species.

In the case of species not mentioned in the Systematic Section, it may be taken more or less for granted that Heinrich's treatment of the species is correct or at least that no changes in nomenclature are warranted at the present time.

THE MALE AND FEMALE GENITALIA

As regards the genitalia of the *Anchylopera*, good differentiating characters can be found in certain species, while in others the resemblances are so close as to render them of little value as a means of specific separation. This was noted by Heinrich in his revision (p. 233) when he states that "the genitalia are often so similar as to be no help in separating color forms." From this he drew the conclusion that "the main trouble probably is that we have too many names." With this statement the author cannot agree, as he is of the opinion that apparent similarity of genitalia does not always indicate specific identity. From our limited knowledge of the early stages of the species it would appear that in most cases the larvae of individual species are restricted to a single food plant or to a closely allied group of plants and that the resulting adults are quite constant in color and maculation.

According to the structure of the male aedeagus the species fall into two groups. What may be termed Group 1 contains the species *subaequana* Zeller and its variants, *pulchellana* Clemens, and the recently described *rhodorana* McDunnough (1954, Amer. Mus. Novitates, no. 1686, p. 2). In these the aedeagus is strongly recurved cephalad in its proximal portion, continuing as a long, thin, curving rod slightly chitinized on the dorsal side and terminating in a small hook; the vesica contains a long series of very minute spicules or cornuti. The recurved portion is not, strictly speaking, a portion of the aedeagus proper but is formed by

projections from the dorsal side of the juxta plate which are attached laterally to the base of the aedeagus; for general purposes, however, the whole portion is termed the aedeagus. Specific differences can be found in the uncus which is practically lacking in *subaequana*, being represented merely by two very slight knobs; in the other two species the uncus is well developed and of the normal bifid character. In the female genitalia, which in most features are quite similar to those of Group 2, the ductus bursae differs very characteristically in being long and chitinized for its entire length except for a very short membranous section where it enters the bursa.

In Group 2, which contains the balance of the species, the aedeagus is generally rather short and chunky, membranous, and only faintly curving dorsad at base; the vesica contains a large cluster of fair-sized cornuti; occasionally a somewhat longer and thinner aedeagus occurs. As in Group 1 the absence or presence of an uncus may be used as a secondary means of separation. *Angulifasciana* (now to be known as *metamelana*) and its close relatives or races, with certain as yet undescribed California species, show the lack of a well-defined uncus. In the other species a bifid uncus is present, so closely similar in all forms as to be of doubtful use as a distinguishing character. In conclusion it may be mentioned that the general type of male clasper is constant throughout the species of the genus. The basal portion (sacculus) shows a pointed projection of variable size terminating its ventral edge. This is followed by a large, usually semicircular excavation, leaving the costal portion as a neck to which the cucullus is attached. This section is fairly long and narrowly rounded apically, its basoventral edge forming the outer margin of the above-mentioned semicircular excavation; the whole ventral side is strongly setose. Figure 35 of Heinrich's revision gives an excellent idea of the whole structure. Warning must be given that the size of the pointed projection of the sacculus and the length and width of the cucullus are subject to considerable individual variation within a single species and that these characters must be used with extreme caution as a means of specific determination.

In the female genitalia the chitinous genital plate forms a somewhat raised, narrow, semilunate, transverse plate which to a certain extent protects the semicircular ostium. According to its raised or flattened condition on the slide it may appear to vary somewhat in shape. From the ostium the ductus bursae arises, its short, initial section being in most species weakly chitinized and soon narrowing to a membranous tube of moderate length. This enters the proximal end of the large, oval, membranous bursa, to the distal end of which an additional smaller glo-

bular section is frequently attached. The bursa is armed with two large, lateral, spear-shaped signa, of which the one on the right side is generally considerably the larger; these signa are subject to a good deal of individual variation.

As it is practically impossible to secure any two genitalic preparations in exactly the same position on a slide, especially in the female sex, great care must be taken that apparent minor differences are not credited with specific value.

SYSTEMATIC SECTION

Anchylopera discigerana Walker

Grapholita discigerana WALKER, 1863, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 28, p. 384.

Anchylopera lamiana CLEMENS, 1864, Proc. Ent. Soc. Philadelphia, vol. 3, p. 513. FERNALD, 1882, Trans. Amer. Ent. Soc., vol. 10, p. 55.

Phoxopteryx discigerana, WALSINGHAM, 1879, Illustrations of typical specimens of Lepidoptera Heterocera in the collection of the British Museum, pt. 4, p. 72, pl. 77, fig. 3 (*partim*).

Anchylopera discigerana, HEINRICH, 1923, Bull. U. S. Natl. Mus., no. 123, p. 236 (*partim, nec* fig. 392). McDUNNOUGH, 1927, Canadian Ent., vol. 59, p. 274.

Anchylopera spiraeifolia, HEINRICH (*nec* Clemens), 1923, Bull. U. S. Natl. Mus., no. 123, p. 236, pl. 56, fig. 395.

Anchylopera metamelana, HEINRICH (*nec* Walker), 1931, Proc. U. S. Natl. Mus., vol. 79, art. 13, p. 13.

The name *discigerana* was based on specimens collected by Lieutenant Redman in Nova Scotia, presumably in the vicinity of Halifax, and the holotype is in the British Museum. The species appears to be uncommon in Nova Scotia, and so far my collection contains only two males: the one collected at Halifax, July 4, 1951, and the other at White Point Beach, Queens County, July 14, 1953. Mr. J. W. Bradley of the British Museum has furnished the information that the holotype lacks an abdomen but that the specimen from the Canadian National Collection, marked by W. T. Tams as agreeing with the type (*vide* my note of 1927), is correctly named. This specimen was recently again submitted to Mr. Bradley for confirmation and has also been found to match the two Nova Scotia specimens excellently. Mr. Bradley was further kind enough to send a female paratype (abdomen lacking) for examination, and a study of this specimen leaves little doubt as to the correctness of the identification, in spite of the fact that no genitalic slides could be made.

Heinrich's determination of the species in his revision, following the lead of Walsingham (1879), is quite erroneous, based as it was on

California material. The species he lists as *spiraeifoliana* proves, however, to be actually the true *discigerana*, and his figure 395 is a correct representation of the male genitalia, although, owing to foreshortening, the two prongs of the bifid uncus are somewhat indistinct. It has been possible, through the cooperation of Mr. J. F. Gates Clarke of the United States National Museum, to examine the slide and also the specimen itself from Wyoming County, Pennsylvania. Other specimens from the same locality (*ex* collection Kearfott) in the American Museum of Natural History collection have also been available for study. The Canadian National Collection contains a series of specimens of this same species from numerous localities in eastern and northwestern Ontario and southeastern Quebec, including a male from East Angus, bred from larva on birch.

As regards the name *lamiana* Clemens, the type, which appears to be lost, was stated to have been taken by A. S. Packard at Brunswick, Maine. Dr. A. E. Brower of Augusta, Maine, has submitted considerable material from this state for identification, including specimens bred from birch-feeding larvae which, together with others, undoubtedly belong to *discigerana*; he states that "the birch-feeder turns up widely in Maine, but in small numbers." As Clemens' description fits these specimens fairly well and as there was nothing else in the Brower material to which the name could possibly be applied, the safest procedure seems to be to sink the name *lamiana* as a synonym of *discigerana*. This had already been done doubtfully by Heinrich, although, as noted, his determination of the latter name was incorrect.

Anchylopera metamelana Walker

Grapholita metamelana WALKER, 1863, Catalogue of the Lepidoptera Heterocera in the British Museum, pt. 28, p. 385; pt. 35, p. 1795. WALSINGHAM, 1879, Illustrations of typical specimens of Lepidoptera Heterocera in the collection of the British Museum pt. 4, p. 73.

Grapholita discoferana WALKER, 1863, *op. cit.*, pt. 28, p. 386. WALSINGHAM, 1879, *op. cit.*, pp. 72-73.

Phoxoperis angulifasciana ZELLER, 1875, Verhandl. Zool. Bot. Gesell. Wien, vol. 25, p. 256, pl. 8, fig. 10. New synonymy.

Ancylis angulifasciana, GROSSARD, 1916, Bull. Ohio Agr. Exp. Sta., no. 296 (life history).

Anchylopera angulifasciana, HEINRICH, 1923, Bull. U. S. Natl. Mus., no. 123, p. 238, pl. 56, fig. 391.

The holotype female of *metamelana* and the holotype male of *discoferana* both came from the Carter collection, and the locality for both was simply given as "North America." Walsingham first called attention

to the fact that the two specimens appeared to be conspecific but placed them wrongly under *spiraeifoliana*, a procedure that was later followed by Heinrich. Walsingham also noted that certain specimens placed by Walker under the type series of *discigerana* should be transferred to this species. Mr. J. D. Bradley has confirmed Walsingham's opinion as to the identity of the two names; he states that the type of *metamelana* is without abdomen but that a genitalic slide has been made of the type of *discoferana*. He has also submitted for study one of the male specimens from Nova Scotia, transferred to this species by Walsingham, together with the genitalic slide which is said to agree with that of *discoferana*. The small size of the type specimens and the fact that the male genitalia lack an uncus and in other respects are similar to those of *angulifasciana* warrant, in the author's opinion, the sinking of *angulifasciana* to the prior name *metamelana* which has page priority over *discoferana*. It is unfortunate that Zeller's type lacks an abdomen, according to Bradley, but specimens sent for comparison are stated to match the type in maculation and agree with the conception of the species as treated by Heinrich in his revision.

Intermediaria Kearfott has been placed by Heinrich as a direct synonym of *angulifasciana*. It was based on specimens from Wellington, Vancouver Island, British Columbia, and judging by typical specimens examined in material from the American Museum and a few others in the Canadian National Collection from the interior of the province the name could be held in a racial sense for the form from western Canada. It appears, as far as can be judged by the rather poor material studied, to be larger in size and duller in color than the typical eastern form.

Maritima Dyar was treated as a good species by Heinrich, although noted as very close to *angulifasciana*. It was separated on account of the "more elongate cucullus of the harpe." This is a rather variable character in *Anchylopera* species and probably not constant in *maritima*. However, the form differs in its much duller coloration and lack of well-defined maculation of the primaries as well as in the different larval food plant, this being beach pea (*Lathyrus maritima*) while clover (*Trifolium*) is given as the food plant of *angulifasciana*. On the other hand, long series of specimens collected by the author and bred from larvae on beach pea at White Point Beach, Nova Scotia, and also taken around beach pea at Parrsboro in the same province approach in maculation much more closely *angulifasciana* than *maritima*, differing only in the generally somewhat larger size, and in the fact that the outer edge of the dark basal patch on inner margin of primaries is more oblique than in typical *angulifasciana* as shown in Zeller's figure and in an enlarged photograph

of his type kindly furnished by Mr. Bradley. The early stages of this form were described under the name *maritima* (1935, Canadian Ent., vol. 67, p. 76). It would seem that eventually *maritima* may have to be considered as a race of *metamelana*, occurring in coastal regions from Maine to Long Island, but the author hesitates to do so at present as he is unacquainted with the *Trifolium*-feeding larva which may show differentiating characters.

The holotype of *angulifasciana* is not, as stated by Heinrich, the specimen from "Ohio (Schlager)" but one of those from "Massachusetts (Burgess)."

Anchylopera laciniana Zeller

Phoxopterus laciniana ZELLER, 1875, Verhandl. Zool. Bot. Gesell. Wien, vol. 25, p. 253, pl. 8, fig. 8.

Ancylis laciniana, KEARFOTT, 1905, Canadian Ent., vol. 37, p. 253 (recorded from Manitoba).

Anchylopera laciniana, HEINRICH, 1923, Bull. U. S. Natl. Mus., no. 123, p. 240, pl. 56, fig. 397 (*partim*).

From comparison of specimens sent to Mr. Bradley to be compared with Zeller's type from Massachusetts (Burgess) and from a study of an enlarged photograph of this type, it would appear to be definitely established that the name applies to the species with oak-feeding larvae found in Nova Scotia and New England. A series has been reared by the author at Halifax from larvae on red oak; a long series was formerly collected by him in an oak grove at South Milford, Nova Scotia, and the Brower collection also contains a series of specimens bred in Maine from larvae on oak. Besides the Nova Scotia specimens, the Canadian National Collection contains specimens from eastern Ontario, the Quebec region approximate to Ottawa and also south of the St. Lawrence River, and a single specimen from Tuxedo, New York. In western Canada it occurs in Manitoba (Aweme) and also in British Columbia (Canoe).

As regards Heinrich's determination of the species, his specimen from Mountain Lake, Virginia, and its figured genitalic slide (fig. 397) have been available for study. While, as Heinrich states, the genitalia show no tangible differences either from the species listed by him as *fuscociliana* or indeed from the typical oak-feeder, it has been noted that in his specimen the white areas of primaries are duller in color, the dark basal patch is lighter brown, and the secondaries are distinctly deeper fuscous than the corresponding areas in the true *laciniana*. This specimen, in the author's opinion, belongs to the same species as the specimen from the same locality (Mountain Lake) placed under *fuscociliana* with figured

genitalia (fig. 399). Whether these Virginia specimens are merely a southern form of *laciniana* or are really referable to *fuscociliana* cannot be determined until larval food plants of the species occurring in Virginia are known and bred series are available for study. The above specimens do not match at all well the present idea of the latter species, as determined both by specimens compared with the female type of *fuscociliana* by Kearfott and now in the American Museum, and also by Freeman who has marked a female in the Canadian National Collection from Ottawa (C. H. Young) as an "identical match" with Clemens' type.

As far as can be determined from limited material contained in the American Museum collection, including a specimen simply labeled "Mo.," the name *murtfeldtiana* Riley (1881, Trans. St. Louis Acad. Sci., vol. 4, p. 323) will fall here rather than as a synonym of *burgessiana* as listed by Heinrich. It was stated to be an oak-feeder and could readily be treated as a small western race of *laciniana*. However, for the present this is offered as a mere suggestion rather than a definite placement as a synonym.

In the Halifax region the larva occurs in late summer on red oak, living at first in a white silken web placed on the under side along the midrib of a leaf. Later it forms a large tent near the apex of the leaf, hibernating in a small tight fold at the edge and pupating in spring in the same place. In color it is deep blackish green with large, pale pinacula; the head and prothoracic shield are paler and show the usual lateral black spotting characteristic of most *Anchylopera* species.

Anchylopera spiraeifoliana Clemens

Anchylopera spiraeifoliana CLEMENS, 1860, Proc. Acad. Nat. Sci. Philadelphia, p. 348.

Phoxopteris spiraeifoliana, ZELLER, 1875, Verhandl. Zool. Bot. Gesell. Wien, vol. 25, p. 251 (emended spelling).

Anchylopera spiraeifoliana, HEINRICH, 1923, Bull. U. S. Natl. Mus., no. 123, pp. 236-237 (*partim*); 1931, Proc. U. S. Natl. Mus., vol. 79, art. 13, p. 13 (correct identity).

The misidentification of this species in Heinrich's revision was corrected by him on the strength of specimens actually bred from *spiraea* by Annette Braun. He also mentions that the so-called "homotype" under this name in the Fernald collection should be referred to *angulifasciana* (now placed as a synonym of *metamelana*).

In the Canadian National Collection there is a series of specimens bred from larvae on *Physocarpus* (*Spiraea*) *opulifolius* at Vineland Station, Ontario, by W. L. Putman, as well as a few specimens bred by the author from larvae on the same food plant at Ottawa. The species is a small one,

very similar in size and maculation to *burgessiana* but lacking the ruddy suffusion in the terminal area of primaries.

In conclusion, a study of Pacific Coast material, formerly wrongly placed as *discigerana* by both Walsingham and Heinrich, has resulted in the discovery of two new species and several subspecies. The descriptions of these follow.

Anchylopera columbiana columbiana, new species

Anchylopera lamiana McDUNNOUGH (*nec* Clemens), 1927, Canadian Ent., vol. 69, p. 274.

Palpi white, slightly tinged with pale brown along the second joint at base. Front and thorax deep chocolate brown, the patagia bordered on their lower edge with white. Primaries with costa from base to oblique brown cross band white, marked along the edge with numerous brown spots, some of which are faintly extended across the whole area. Basal patch on inner margin large, deep chocolate brown, with a flatly rounded projection into the cell in its apical half; outer margin obliquely rounded. Bordering this patch outwardly is a narrow extension of the white costal area, strongly suffused, and at times almost obliterated, with brown sprinkling which causes it to assume a slightly bluish tinge. A broad, chocolate brown, oblique bar arises in the median area of costa and extends to the central area of the wing, terminating in a similarly colored brown, more or less triangular patch, the basal edge of which projects outward beyond the margin of the band. This brown band is bordered outwardly by a narrow white area which shows the same bluish or leaden suffusion already mentioned. The outer half of costa shows numerous deep brown, oblique striae which are continued by lighter brown streaks merging together into a faint patch just below the deep brown apex of wing; these striae are separated by fine, white lines. Above the tornus are traces of a thin, deep brown patch, more distinct in the female than in the male, and often connected with the oblique costal cross bar. The speculum which occupies the entire inner half of the marginal area of the wing is large, faintly bluish in color, sprinkled with some variable light brown speckles and showing little trace of any transverse black streaks. There is a fine, black, marginal line, bordered inwardly by broken white shading. Fringes white, shaded with light brown, especially outwardly, and cut by a black streak just below apex of wing. Secondaries light smoky, with paler fringes. Expanse, 18–20 mm.

MALE GENITALIA: Characterized by the strong terminal projection of the sacculus with truncate apex, the very deep, broad excavation of the medioventral margin of the clasper and the small, chunky, more or less

hammer-shaped cucullus. This latter section is subject to a certain amount of variation in its apical extension, and two figures are given (fig. 1A, B) to depict this. In figure 1A, made from a paratype from the same locality as the holotype, the projection is quite limited, and in consequence the whole cucullus appears very chunky, the costal edge of the entire clasper being virtually straight from base to apex of cucullus. In figure 1B from a paratype from Kathleen Mountain, Peachland, which cannot be distinguished, in either size or maculation of primaries, from the other paratype, there is considerably more apical projection and the costal margin, in consequence, bends upward in its distal portion. As regards the other sections of the organ, the tegumen is broadly rounded at its apex, but the uncus is lacking, being represented merely by two minute knobs. The socii are well developed and much as in other species. The aedeagus is moderately long and wide, pointed apically; it curves dorsad in its proximal section, bending gradually ventrad towards the apex. The vesica (in all specimens examined) is armed with a large area of very minute spicules which may possibly represent the bases of cornuti discharged into the female bursa during copulation.

FEMALE GENITALIA: Genital plate chitinous, narrow, and semilunate, extending transversely across the entire segment, with slight caudad extensions on its outer edges. Ostium arising medially, semicircular. Ductus bursae short, its initial portion lightly chitinized and slightly broader than the following membranous section which enters the bursa at its apex. Bursa large, oval, membranous, covered with minute spicules. Signa large, sagittate, the signum on the right side about twice the length of that on the left side.

HOLOTYPE: Male, Penticton, British Columbia, June 7, 1933 (J. McDunnough).

ALLOTYPE: Female, same data.

PARATYPES: One male, five females, same data. Two males, one female, Shingle Creek, Penticton, British Columbia, June 7, 1933; one male, one female, Summerland, British Columbia, May 22, 1935; one male, two females, Okanagan Mountains, Kelowna, British Columbia, June 6, 1935; two males, one female, Kathleen Mountain, Peachland, British Columbia, June 23, 1936. All collected by A. N. Gartrell.

The holotype and allotype are deposited in the Canadian National Collection. Besides paratypes in the same collection and in that of the author, others will be distributed to the United States National Museum and the American Museum of Natural History.

REMARKS: In addition to the above types, a small series of four males and one female in the United States National Museum from Blewett

Pass, Washington State, June 10, 1929 (J. F. Gates Clarke), and two worn specimens from Inyo County, California (O. Poling), have been examined and found to belong to this species but have not been included in the type series. The Canadian National Collection also contains a single male from Meeks Bay, Lake Tahoe (W. Sicker), which is placed here on size and genitalic characters.

If the author remembers correctly, the *Penticton* specimens were taken on the slopes of a hill just east of the town around *Ceanothus* which may possibly be the larval food plant.

Anchylopera columbiana shastensis, new subspecies

Among the material submitted for study from the United States National Museum was a small series of specimens from Shasta Retreat, Siskiyou County, California, which originally came from the Barnes collection, as they had been taken by the author in 1917 when he was curator of this collection. These specimens have the same type of maculation as those from British Columbia, and apart from their much smaller size there is nothing distinctive in the markings or coloration of the primaries by which this race can be distinguished. In three of the specimens the fringes appear to be entirely white, but one female shows a slight trace of light brown coloration. The wing expanse is 14–15 mm. as compared with the normal 20 mm. found in the typical form.

In the genitalia the whole male organ is considerably smaller than that of British Columbian specimens. The clasper is very similar in structure to that of the figured Peachland specimen, showing the same strong truncate projection of the sacculus and the apical extension of the cucullus. The aedeagus is markedly thinner but bears the same type of armature in the vesica. In the female organ the genital plate, while similar in structure, is less broad than in the type form and the signa of the bursa are noticeably smaller.

HOLOTYPE: Male, Shasta Retreat, Siskiyou County, California, June 8–15.

ALLOTYPE: Female, same data.

PARATYPES: One male and one female, same data.

All the types are in the United States National Museum.

REMARKS: In addition to the types there are several other specimens from the same locality in the United States National Museum material which probably belong here but are not included in the type series as they bear different dates of capture, viz., "July 1–7" and "August 16–23." A single small male from Deer Park Springs, Lake Tahoe, California, also is placed here on the basis of the genitalia, although another male from the same general region has been mentioned under the typical form,

owing to its size and larger genitalia. There are also five specimens labeled as from the Fernald collection; three of these (two males and a female) bear the labels "Placer Co., Cal. Through C. V. Riley"; the other two (male and female) are unlabeled, although probably from the same source. Judging by the size and the male genitalia these would also fall under *shastensis*.

Anchylopera simuloides simuloides, new species

Very similar to the preceding species and scarcely separable on maculation of primaries but differing sufficiently in male genitalia to warrant description as a separate species.

Palpi much as in *columbiana*, white, with the basal portion of the second segment tinged with brown. Vestiture of head and thorax deep brown, the patagia bordered on their lower margin with white; the vestiture of the scutellum white, primaries quite similar in color and maculation to those of *columbiana*. The white areas are less suffused with smoky sprinkling, especially in the band bordering the outer margin of the large, chocolate brown, basal patch. This patch is quite similar to that of *columbiana*. The oblique, brown costal band is more clearly outlined and narrows at its junction with the following triangular patch (this feature may not be constant). The speculum is distinctly whiter than the same area in *columbiana* and shows less of the bluish tinge and the brown sprinkling. Three chocolate brown, triangular spots on the terminal portion of costa are considerably larger than the streaks found in *columbiana*; they are separated by white bands through which fine, brown, oblique streaks run, converging into the same light brown area found in *columbiana*. The terminal area and fringes are much as in *columbiana*. Secondaries also similar. Expanse, about 18 mm.

MALE GENITALIA: As may be noted from the figure (fig. 1D) the clasper shows marked differences from that of *columbiana*. The prominent, truncate projection of the sacculus is lacking, the terminal area showing merely a broad, outward bulge. The excavation between the sacculus and the cucullus is not so broad and the cucullus is upright, with a long apical extension and little downward curve at its base. The remaining sections of the genitalia show little difference from those of *columbiana*. The uncus is lacking, the socii appear to be slightly larger, but this may be simply a matter of position, and the aedeagus, while similar in size, contains a large bundle of very fine cornuti, corresponding in length to the spiculate area noted in *columbiana*.

HOLOTYPE: Male, Deep Creek, Peachland, British Columbia, 3500 feet, July 5, 1933 (A. N. Gartrell), in the Canadian National Collection.

REMARKS: The species apparently occurs nearly a month later and at

higher altitude than *columbiana*. The specimen from St. John's, Newfoundland, in the Canadian National Collection, mentioned by the author as *lamiana* (1927, Canadian Ent., vol. 69, p. 274) appears to agree with the type in genitalia and also in maculation as far as can be determined from its rather worn condition.

Anchylopera simuloides sierrae, new subspecies

Anchylopera discigerana, HEINRICH (*nec* Walker), 1923, Bull. U. S. Natl. Mus., no. 123, p. 236, pl. 56, fig. 392.

The specimen from Placer County, California, with its genitalic slide, on which Heinrich based his identification of *discigerana* has been sent for study. This specimen agrees with material sent from the United States National Collection (ex Barnes collection) and collected at Mineral King, Tulare County, California. It does not, however, match in genitalia the specimens from the Fernald collection which, although from the same locality, have been already placed under *shastensis*. As the Mineral King material agrees excellently in male genitalia with the holotype of *simuloides* and as the maculation and coloration of the specimens are also very similar, it seems best to treat these as a southern race of the northern form and thus tie down definitely Heinrich's misdetermination. In size this southern form is scarcely smaller than the typical one. The maculation of primaries is also very similar, including the three large, triangular spots along the terminal portion of the costa. The white areas in the outer half of the wing are more suffused with brown sprinklings and much as in *columbiana*. There is, further, a better-defined brown patch above the tornus and another transverse streak below the light brown, subapical coloration. The speculum is less distinct, owing to the increase of brown sprinkling.

MALE GENITALIA: Quite similar to those of the holotype of *simuloides* and well illustrated by Heinrich's figure 392.

FEMALE GENITALIA: Very close to those of *shastensis* and separable only by the greater width of the initial section of the ductus bursae and by the slightly larger signa in the bursa. Both these characters are rather unstable but are constant in the two preparations examined. When the fact that throughout the whole group the female genitalia offer very poor characters for specific separation is taken into consideration, it is not to be wondered at that little can be found to distinguish such closely allied forms as *shastensis* and *sierrae*.

HOLOTYPE: Male, Mineral King, Tulare County, California, June 24-30.

ALLOTYPE: Female, same data.

PARATYPES: Two males, same locality, but one dated July 8-15; two females, same locality, dated July 1-7.

All the types are in the United States National Museum.

REMARKS: Heinrich's Placer County specimen has not been included in the type series. It bears a handwritten label, "Pla. Co. Cal. V.1, A.H.V.," and obviously was collected by A. H. Vachell, an old-time entomologist whose system of labeling was sometimes very erratic. Among the United States National Museum specimens was a single female from Monachee Meadows, Tulare County, California, July 16-23, which probably belongs here. The abdomen, however, had at one time been broken off and was glued to the label. When a preparation was made, parts of the genitalia were found to be broken. Both the Monachee Meadows and the Mineral King material was collected by G. R. Pilate at an altitude of between 7000 and 8000 feet; for many years Pilate was one of Barnes's collectors in the higher altitudes of the Sierras.

Anchylopera simuloides litoris, new subspecies

With the material submitted by the United States National Museum for study was a small series of specimens from Carmel, California, evidently sent by the American Museum of Natural History to Heinrich at the time he was preparing his revision, as noted in his introduction. These specimens carry both the American Museum label and the Kearfott collection label.

While the coloration and maculation of the primaries agree with those of *sierrae*, all these specimens show a consistently even brown color of the palpi; the white bordering of the patagia also inclines to spread inward. In the genitalia of both sexes there is nothing tangible by which the form could be separated from *sierrae*. Two specimens from San Diego agree with the above in palpal coloration.

As such characteristics appear to be confined to specimens from low-lying coastal areas, it seems advisable to assign subspecific value to them, and the above name is therefore proposed.

HOLOTYPE: Male, Carmel, California, June (A. H. Vachell).

ALLOTYPE: Female, same data.

PARATYPES: Three males, same data, but two males bear the date "IV"; one male, one female, San Diego, California, June 20, 1911 (W. S. Wright).

As it was Heinrich's procedure when describing new species from American Museum material to return the types to this institution it would appear to be only just to follow the same procedure in the present

case. Hence the holotype and allotype are deposited with the American Museum. The paratype series is being returned to the United States National Museum.

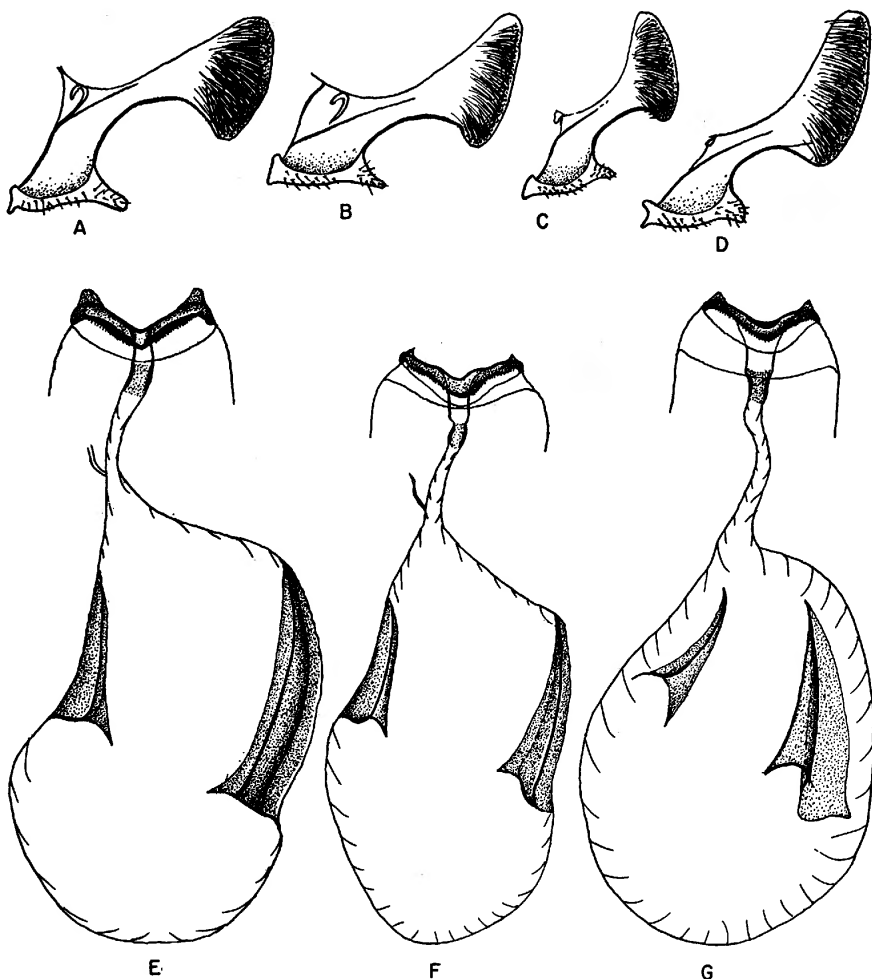


FIG. 1. Genitalia. A-D. Male claspers. A. *Anchylopera columbiana columbiana* McDunnough, paratype, Penticton, British Columbia. B. Variant of same species, paratype, Peachland, British Columbia. C. *A. columbiana shastensis* McDunnough, paratype. D. *A. simuloides simuloides* McDunnough, holotype. E-G. Female genitalia. E. *A. columbiana columbiana* McDunnough, paratype, Penticton, British Columbia. F. *A. columbiana shastensis* McDunnough, paratype. G. *A. simuloides sierrae* McDunnough, allotype.